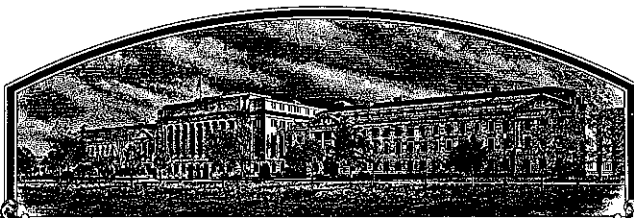


No.

9400038



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Arizona Plant Breeders, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE
Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT. THE UNITED STATES SEED OF THIS VARIETY (1) SHALL BE SOLD BY VARIETY NAME ONLY AS A CERTIFIED SEED AND (2) SHALL CONFORM TO THE NUMBER OF GENERATIONS SPECIFIED BY THE OWNER OF THE RIGHTS. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

BARLEY

'Mucho'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this 31st day of August in the year of our Lord one thousand nine hundred and ninety-four.

Attest:

Kenneth H. Evans

Commissioner

Plant Variety Protection Office
Agricultural Marketing Service

Mike Essy
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE DIVISION

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(INSTRUCTIONS ON REVERSE)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate)

Arizona Plant Breeders, Inc.

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO.

F-3

3. VARIETY NAME

Mucho

4. ADDRESS (street and no. or R.F.D. no., city, state, and ZIP)

P.O. Box 5985
Arizona City, AZ 85223

5. PHONE (include area code)

(602) 466-5917

FOR OFFICIAL USE ONLY

PVPO NUMBER

9400038

6. GENUS AND SPECIES NAME

Hordium Vulgare

7. FAMILY NAME (Botanical)

Graminea

8. CROP KIND NAME (Common Name)

Barley

9. DATE OF DETERMINATION

March 11, 1993

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Date

December 2, 1993

Time

4:00 ☐ A.M. ☒ P.M.

Filing and Examination Fee:

\$ 2325.00

Date

December 2, 1993

Certificate Fee:

\$ 275.00

Date

July 25, 1994

10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.)

Corporation

11. IF INCORPORATED, GIVE STATE OF INCORPORATION

Montana

12. DATE OF INCORPORATION

January 18, 1989

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS

Dr. Albert E. Carleton
P.O. Box 5985
Arizona City, AZ 85223

PHONE (include area code): (602) 466-5917

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow INSTRUCTIONS on reverse)

a. ☒ Exhibit A, Origin and Breeding History of the Variety

b. ☒ Exhibit B, Novelty Statement

c. ☒ Exhibit C, Objective Description of Variety

d. ☐ Exhibit D, Additional Description of Variety

e. ☒ Exhibit E, Statement of the Basis of Applicant's Ownership

f. ☒ Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office 11/29/93

g. ☒ Filing and Examination Fee (\$2,325) made payable to "Treasurer of the United States"

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See section 83(a) of the Plant Variety Protection Act) ☒ YES (If "YES," answer items 16 and 17 below) ☐ NO (If "NO," skip to item 18 below)

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?

☒ YES ☐ NO

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?

☒ FOUNDATION ☒ REGISTERED ☒ CERTIFIED

18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?

☐ YES (If "YES," through ☐ Plant Variety Protection Act ☐ Patent Act. Give date: _____).

☒ NO

19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?

☒ YES (If "YES," GIVE NAMES OF COUNTRIES AND DATES) U.S.A. Dec. 1992 through Feb. 1993

☐ NO

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT [Owner(s)]

Albert E. Carleton

CAPACITY OR TITLE

President

DATE

11/29/93

SIGNATURE OF APPLICANT [Owner(s)]

CAPACITY OR TITLE

DATE

Mucho Barley14.a. Exhibit A, Origin and Breeding History of Mucho Barley.

Mucho barley was selected by Arizona Plant Breeders, Inc. at Casa Grande, Arizona in the spring of 1988 as a single F₂ plant from a genetic male sterile facilitated recurrent selection population. This population was developed by Dr. R. T. Ramage, U.S.D.A., ARS and the University of Arizona and released as Composite Cross XXXII-86. An F₃ row was grown at Galen, Montana in the summer of 1988. Four heads were selected from this row and seeded in Arizona as an F₄ plot consisting of four single rows in the fall of 1988. Twenty-four (24) heads were taken from one F₄ row within the plot and seeded in Montana in the spring of 1989. Eighteen (18) uniform, non-segregating F₅ rows were bulked to form the F₆ generation. The resulting F₆ bulk was used for yield testing in Arizona and California and used to produce the F₇ generation in Arizona during the fall of 1989. The bulk F₇ seed was used to plant a small increase during the summer of 1990 in Montana. The F₈ seed harvested from Montana was designated basic seed and was used to produce Breeders seed during the winter of 1990 in Arizona.

Mucho has a light blue aleurone variant that occurs at the frequency of 1 in 10,000 seeds, and a tall variant that occurs at a frequency of 1 in 20,000 plants. Currently, Mucho is being head-rowed in an attempt to eliminate these variants.

Mucho is a stable and uniform variety in agronomic appearance and performance across several generations and environments. Agronomic data to support stability is presented in Tables I.a. through d.

ADDENDUM TO EXHIBIT A FOR
MUCHO BARLEY
APPLICATION NO. 940038

F₂ plants were selected for plant height and large heads and seeds. F₃ rows grown in Montana out of the area of adaptation, were not selected for any agronomic traits. F₄ plots were evaluated for plant height, earliness, lodging resistance and straw strength after ripening. Several different F₄ plots were selected and 24 heads were taken to Montana for increase. The bulk of these F₅ rows were evaluated in replicated yield trials for agronomic traits such as maturity, plant height, lodging, grain yield and test weight were measured.

Mucho Barley14.b. Exhibit B, Novelty Statement.

Mucho is a semidwarf, six-rowed, spring barley, early in maturity with short, strong straw. Mucho is most similar in phenotypic appearance to the varieties WestBred Gustoe and WestBred Barcott. Mucho's heading date is 17 days earlier than Gustoe and 4 days later than Barcott. Mucho is 4 to 5 cm. shorter than Barcott. The above comparisons along with the complete objective description (14.c. Exhibit C) show Mucho to be a novel variety of spring barley.

14.e. Exhibit E, Statement of the Basis of Applicant's Ownership.

The variety for which Plant Variety Protection is hereby sought was developed by Dr. Albert E. Carleton, an employee and major stockholder of Arizona Plant Breeders, Inc. ("APB"). By agreement between the employee and APB all rights to any invention, discovery or development made by the employee while employed by APB were assigned to APB with no rights of any kind retained by the employee.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK AND SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Barley)

OBJECTIVE DESCRIPTION OF VARIETY
BARLEY (*HORDEUM VULGARE*)

INSTRUCTIONS: See Reverse.

NAME OF APPLICANT(S)

Arizona Plant Breeders, Inc.

FOR OFFICIAL USE ONLY

PVPO NUMBER

9400038

ADDRESS (Street and No. or R.F.D. No., City, State, and ZIP Code)

P.O. Box 5985

Arizona City, AZ 85223

VARIETY NAME OR TEMPORARY DESIGNATION

Mucho

Place the appropriate number that describes the varietal character of this variety in the boxes below.

Place a zero in first box (i.e. or) when number is either 99 or less or 9 or less.

1. GROWTH HABIT:

1 - SPRING 2 - FACULTATIVE WINTER 3 - WINTER Early Growth: 1 - PROSTRATE 2 - SEMIPROSTRATE
3 - ERECT

2. MATURITY (50% Flowering):

1 - EARLY (California Mariout) 2 - MIDSEASON (Betzes) 3 - LATE (Frontier)

No. of days Earlier than } 1 - BETZES 2 - CALIFORNIA MARIOUT 3 - CONQUEST 4 - DICKSON

No. of days Later than } 5 - PIROLINE 6 - PRIMUS 7 - UNITAN 8 = WB Barcott

3. PLANT HEIGHT (From soil level to top of head):

1 - SEMIDWARF 2 - SHORT (California Mariout) 3 - MEDIUM TALL (Betzes) 4 - TALL (Conquest)

Cm. Shorter than } 1 - BETZES 2 - CALIFORNIA MARIOUT 3 - CONQUEST 4 - DICKSON
 Cm. Taller than } 5 - PIROLINE 6 - PRIMUS 7 - UNITAN x = none of the above

4. STEM:

Exsertion (Flag to spike at maturity): 1 - 0 - 3 cm. 2 - 3 - 10 cm. Anthocyanin: 1 - ABSENT 2 - PRESENT
3 - 10 - 15 cm.

NO. OF NODES (Originating from node above ground)

Collar Shape: 1 - CLOSED 2 - V-SHAPED 3 - OPEN Shape of Neck: 1 - STRAIGHT 2 - SNAKY
4 - MODIFIED CLOSED OR OPEN 3 - OTHER (Specify) _____

5. LEAF:

Basal leaf sheath (seedling): 1 - GLABROUS 2 - PUBESCENT Position of flag leaf (at boot stage): 1 - DROOPING
2 - UPRIGHT

Waxiness: 1 - ABSENT (Glossy) 2 - SLIGHTLY WAXY MM. WIDTH (First leaf below flag leaf)
3 - WAXY

CM. LENGTH (First leaf below flag leaf) Anthocyanin in leaf sheath: 1 - ABSENT 2 - PRESENT

6. HEAD:

Type: 1 - TWO-ROWED 2 - SIX-ROWED Density: 1 - LAX 2 - ERECT (Not dense)
3 - ERECT (Dense)

Shape: 1 - TAPERING 2 - STRAP 3 - CLAVATE Waxiness: 1 - ABSENT (Glossy) 2 - SLIGHTLY WAXY
4 - OTHER (Specify) _____ 3 - WAXY

Lateral Kernels Overlap: 1 - NONE 2 - AT TIP Rachis (Hair on edge): 1 - LACKING 2 - FEW 3 - COVERED
3 - 1/4 - 1/2 OF HEAD

7. GLUME:

Length: 1 - 1/3 OF LEMMA 2 - 1/2 OF LEMMA Hairs: 1 - NONE 2 - SHORT 3 - LONG
3 - MORE THAN 1/2 OF LEMMA

Hair covering: 1 - NONE 2 - RESTRICTED TO MIDDLE 3 - CONFINED TO BAND 4 - COMPLETELY COVERED

Awns: 1 - LESS THAN EQUAL TO LENGTH OF GLUMES 2 - EQUAL TO LENGTH OF GLUMES
3 - MORE THAN EQUAL TO LENGTH OF GLUMES

Awn Surface: 1 - SMOOTH 2 - SEMISMOOTH 3 - ROUGH

8. LEMMA:

- ☐ 5 Awn: 1 = AWNLESS 2 = AWNLETS ON CENTRAL ROWS, AWNLESS ON LATERAL ROWS
 3 = SHORT ON CENTRAL ROWS, AWNLETS ON LATERAL ROWS 4 = SHORT (less than equal to length of spike)
 5 = LONG (longer than spike) 6 = HOODED
- ☐ 3 Awn Surface: 1 = AWNLESS 2 = SMOOTH 3 = SEMISMOOTH 4 = ROUGH
- ☐ 2 Teeth: 1 = ABSENT 2 = FEW 3 = NUMEROUS ☐ 1 Hair: 1 = ABSENT 2 = PRESENT
- ☐ 1 Shape of base: 1 = DEPRESSION 2 = SLIGHT CREASE
 3 = TRANSVERSE CREASE ☐ 2 Rachilla Hairs: 1 = SHORT 2 = LONG

9. STIGMA:

- ☐ 2 Hairs: 1 = FEW 2 = MANY

10. SEED:

- ☐ 2 Type: 1 = NAKED 2 = COVERED ☐ 1 Hairs on Ventral Furrow: 1 = ABSENT 2 = PRESENT
- ☐ 3 Length: 1 = SHORT (8.0 mm.) 2 = SHORT TO MIDLONG (7.5 - 9.0 mm.) 3 = MIDLONG (8.5 - 9.5 mm.)
 4 = MIDLONG TO LONG (9.0 - 10.5 mm.) 5 = LONG (10.0 mm.)
- ☐ 2 Wrinkling of hull: 1 = NAKED 2 = SLIGHTLY WRINKLED 3 = SEMIWRINKLED 4 = WRINKLED
- ☐ 1 Aleurone Color: 1 = COLORLESS (White or Yellow) 2 = BLUE
- ☐ 0 ☐ 1 PERCENT ABORTIVE ☐ 5 ☐ 2 GMS. PER 1000 SEEDS

11. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

- | | | | |
|---------------------------------------|---|---|---|
| <input type="checkbox"/> 0 SEPTORIA | <input type="checkbox"/> 1 NET BLOTCH | <input type="checkbox"/> 0 SPOT BLOTCH | <input type="checkbox"/> 2 POWDERY MILDEW |
| <input type="checkbox"/> 1 LOOSE SMUT | <input type="checkbox"/> 1 BACTERIAL BLIGHT | <input type="checkbox"/> 0 COVERED SMUT | <input type="checkbox"/> 1 FALSE LOOSE SMUT |
| <input type="checkbox"/> 0 STEM RUST | <input type="checkbox"/> 1 LEAF RUST | <input type="checkbox"/> 0 SCAB | <input type="checkbox"/> 1 SCALD |
| <input type="checkbox"/> 0 AY | <input type="checkbox"/> 0 BSMV | <input type="checkbox"/> 1 BYDV | <input type="checkbox"/> 0 OTHER (Specify) |

12. INSECT: (0 = Not tested, 1 = Susceptible, 2 = Resistant)

- | | | | |
|--|--|--|-------------------------------------|
| <input type="checkbox"/> 0 GREEN BUG | <input type="checkbox"/> 0 ENGLISH GRAIN APHID | <input type="checkbox"/> 0 CHINCH BUG | <input type="checkbox"/> 0 ARMYWORM |
| <input type="checkbox"/> 0 GRASS HOPPERS | <input type="checkbox"/> 0 CERIAL LEAF BETTLE | <input type="checkbox"/> 0 OTHER (Specify) | |
| HESSIAN FLY RACES
{ <input type="checkbox"/> 0 GP <input type="checkbox"/> 0 A <input type="checkbox"/> 0 B <input type="checkbox"/> 0 C
<input type="checkbox"/> 0 D <input type="checkbox"/> 0 E <input type="checkbox"/> 0 F <input type="checkbox"/> 0 G | | | |

13. CHEMICAL (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

- ☐ 0 DDT ☐ 0 OTHER (Specify)

14. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	WB Gustoe	Seed size	WB Gustoe
Leaf size	WB Gustoe	Coleoptile elongation	WB Gustoe
Leaf color	WB Gustoe	Seedling pigmentation	WB Gustoe
Leaf carriage	WB Gustoe		

REFERENCES: The following publications may be used as a reference aid for the standardization of character descriptions and terms used in this form:

1. Wiebe, G. A., and D. A. Reid, 1961, Classification of Barley Varieties Grown in the United States and Canada in 1958, Technical Bulletin No. 1224, U.S. Dept. of Agriculture.
2. Reid, D. A., and G. A. Wiebe, 1968, Barley: Origin, Botany, Culture, Winter Hardiness, Genetics, Utilization, Pests, Agriculture Handbook No. 338, U.S. Dept. of Agriculture. pp. 61 - 84.
3. Malting Barley Improvement Association, Milwaukee, Wisconsin, 1971, Barley Variety Dictionary.

COLOR: Nickerson's or any recognized color fan may be used to determine color of the described variety.

Table I.a. Agronomic Data on Feed Barley Varieties from a Trial Conducted by the University of Arizona—Maricopa Station in 1990-91.

<i>Variety</i>	<i>Source</i>	<i>Heading Date</i>	<i>Plant Height (cm.)</i>	<i>% Lodging</i>	<i>Test Weight (lbs./bu.)</i>	<i>Yield (lbs./ac.)</i>
WB Gustoe	WPB	03-19	91	40%	52	5,500
APB Mucho	APB	03-02	86	50%	51	5,458
Sunbar 458	NK	03-14	97	30%	46	5,283
Arivat	Public	03-05	117	70%	48	3,741

Table I.b. Yield Data of Feed Barley Varieties Conducted by Arizona Plant Breeders in 1990-91 at 3 Locations.

<i>Variety</i>	<i>Casa Grande, AZ (lbs./ac.)</i>	<i>% of Gustoe</i>	<i>El Centro, CA (lbs./ac.)</i>	<i>% of Gustoe</i>	<i>Delano, CA (lbs./ac.)</i>	<i>% of Gustoe</i>
APB Mucho	6,623	97%	5,025	107%	7,262	116%
WB Gustoe	6,856	100%	4,677	100%	6,274	100%

Table I.c. Agronomic Data on Feed Barleys from a Trial Conducted by the University of Arizona—Maricopa Station in 1992-93*.

<i>Variety</i>	<i>Heading Date</i>	<i>Plant Height (cm.)</i>	<i>% Lodging</i>	<i>Test Weight (lbs./bu.)</i>	<i>Yield (lbs./ac.)</i>
WB Gustoe	3/28	71	23%	51.1	5,603
APB Mucho	3/19	74	0%	51.8	5,296
WB Barcott	3/17	71	0%	46.1	4,431

* (no trial was conducted in 1991-92.)

Table I.d. Agronomic Data on Feed Barley from a Trial Conducted by Arizona Plant Breeders in 1991-92 in Arizona.

<i>Variety</i>	<i>Heading Date</i>	<i>Plant Height (cm.)</i>	<i>% Lodging</i>	<i>Test Weight (lbs./bu.)</i>	<i>Yield (lbs./ac.)</i>
WB Gustoe	3/15	89	40%	50.5	6,450
APB Mucho	2/24	84	0%	50.8	6,310
WB Barcott	2/20	91	0%	48.4	5,115